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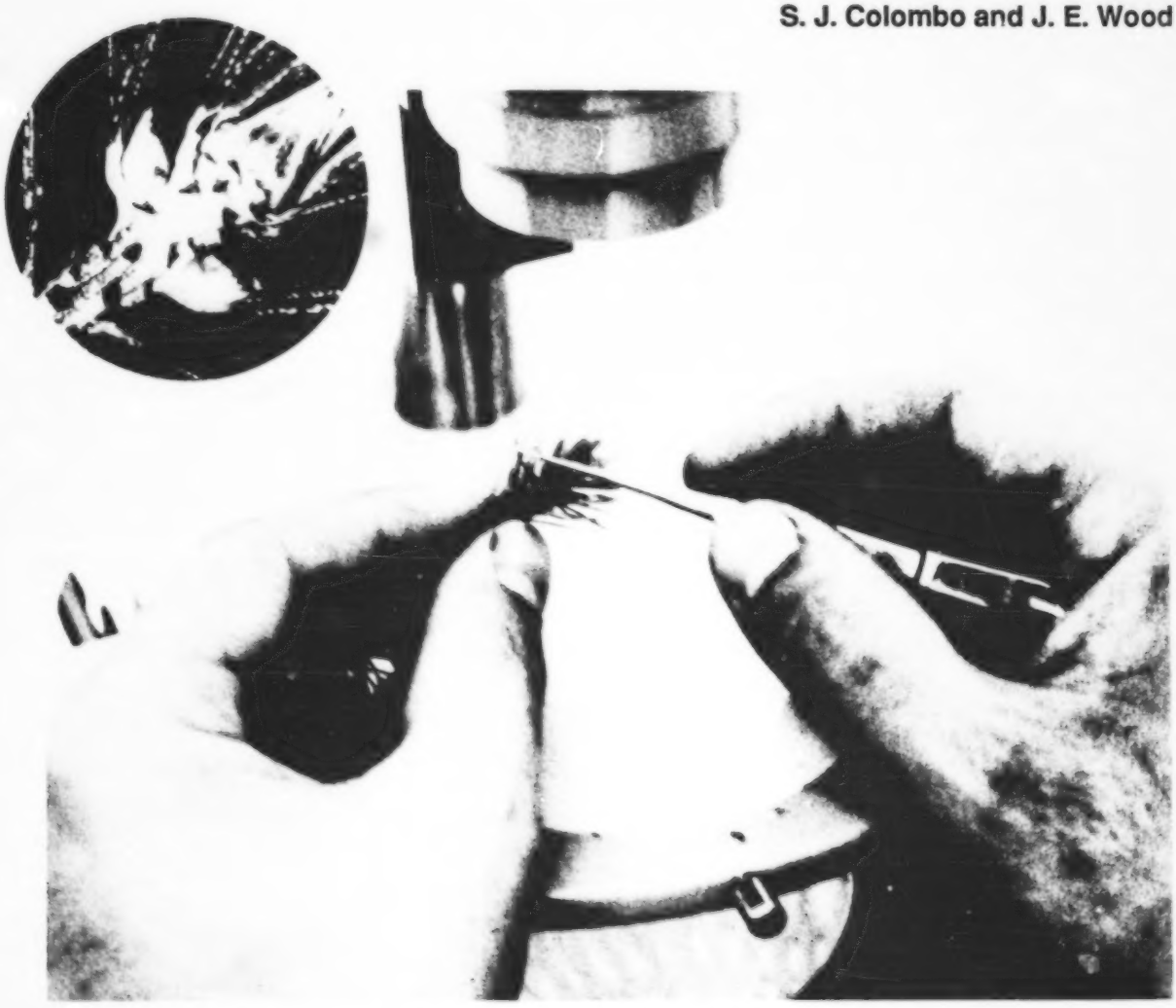
Containerized Tree Seedling Research and Development in Ontario: 1984 - 1985

S. J. Colombo and J. E. Wood



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CONTAINERIZED TREE SEEDLING RESEARCH AND DEVELOPMENT IN ONTARIO: 1984-1985

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ABSTRACT

This is the second register listing research and development activities in the fields of containerized tree seedling production and planting in Ontario. This volume covers the period 1984-1985. Each study reported is annotated with study objectives and the names and affiliations of investigators.

RÉSUMÉ

Ce document est le deuxième registre énumérant les travaux de recherche et de développement dans les domaines de la production et du repiquage de semis d'arbres en contenants, en Ontario. L'ouvrage couvre la période 1984-1985. Pour chaque étude, on indique les objectifs visés ainsi que les noms des chercheurs et des organismes auxquels ils sont associés.

Cover photo of black spruce bud courtesy of K. Odlum, Ontario Tree Improvement and Forest Biomass Institute, Ontario Ministry of Natural Resources.

FOREWORD

The production of containerized tree seedlings in Ontario exceeded that of bare-root nursery stock for the first time in 1985, when more than 75 million container seedlings were produced in comparison with 52 million bare-root seedlings[3]. From 1983 to 1985, container seedling production nearly doubled each year (16.5, 40 and 75 million container seedlings, respectively, were produced in 1983, 1984 and 1985). This increased emphasis on container stock production for forest regeneration in Ontario has been matched or surpassed in nearly all other provinces.

The purpose of this registry is to document containerized tree seedling research and development activities in Ontario in 1984-1985, with the dual aim of providing access to up-to-date technical information and aiding in the identification of current and future research needs.

As in the preceding registry, covering the years 1982-1983, [4,5] we have included formal, informal, long-, and short-term studies. This registry is divided into three sections: I. Stock Production (34 submissions), II. Planting Trials (20 studies), and III. Equipment Development (3 studies). Planting trials were those in which field comparisons of stock type or container type were made, often in relation to cultural operations. Although a number of stock production trials included associated outplantings, the focus of these studies was primarily on nursery production.

This compendium was commissioned by the Container Stock Working Group (members listed in Appendix I) of the Canada-Ontario Joint Forestry Research Committee (COJFRC). COJFRC has since been replaced by the Ontario Forestry Research Committee (OFRC).

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[3] Anon. 1986. Statistics 1985. Ont. Min. Nat. Resour., Toronto.

[4] In the 1982-1983 registry, submissions on studies conducted at the Swastika Tree Nursery were inadvertently omitted. These studies are presented in the current volume and are indicated by the dates (1982-1983) following the study title.

[5] Wood, J.E. and Colombo, S.J., *Comp.* 1984. A registry of containerized tree seedling research in Ontario: 1982-1983. Gov't of Can., Can. For. Serv., Sault Ste. Marie, Ont. Joint Rep. No. 4. 23 p. + appendices. Published under the auspices of the Canada-Ontario Joint Forestry Research Committee.

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SECTION I

Stock Production

1) DORMANCY INDUCTION OF WHITE SPRUCE SEEDLINGS

Investigators: D. Boufford and G.R. McLeod

Affiliation: Ontario Ministry of Natural Resources, Orono Tree Nursery

Objective: To test methods of inducing bud initiation and dormancy in white spruce seedlings. Treatments include chemical applications and the use of inductive photoperiod and temperature regimes. Successful treatments would permit greenhouse transplant stock to be placed in overwinter frozen storage directly from the greenhouse, or would condition grafted stock for a chilling period so as to condense two growing seasons into one and thus shorten the establishment period.

2) FERTILIZER AND NUTRIENT TESTS WITH WHITE PINE, SCOTS PINE AND WHITE SPRUCE

Investigators: D. Boufford and G.R. McLeod

Affiliation: Ontario Ministry of Natural Resources, Orono Tree Nursery

Objective: To test various commercial fertilizers capable of lowering the pH levels of growing media so as to reduce the effect of irrigation water with a high pH (7.5 - 8.2) on potted stock. Potted stock, which remains in the nursery for periods of 2-4 years, has been severely damaged in the past by rising pH.

3) PEAT PILLOWS (1982-1983)

Investigators: R.C. Cameron* and R. Galloway**

Affiliation: *Ontario Ministry of Natural Resources, Swastika Tree Nursery
**Ontario Ministry of Natural Resources, Kirkland Lake District Office

Objective: To develop cultural techniques for growing black spruce and jack pine in peat pillows. Seedlings have been grown and outplanted for three years in the Kirkland Lake District.

4) DEVELOPING GROWING REGIMES FOR BLACK SPRUCE IN DIFFERENT CONTAINER TYPES

Investigators: R.C. Cameron and G. Leveille

Affiliation: Ontario Ministry of Natural Resources, Swastika Tree Nursery

Objective: To determine the nutritional and irrigation requirements for growing black spruce seedlings in Multipots (67s), Combicells, 408 Japanese paperpots (VH, PH and FH paper types), or 308 Japanese paperpots (FH paper only). Seedlings were grown in each container type for 16 or 21 weeks.

5) EFFECTS OF TEMPERATURE AND PHOTOPERIOD ON BLACK SPRUCE SEEDLING GROWTH AND BUD DEVELOPMENT

Investigators: R.C. Cameron, G. Leveille and P. Scheussler

Affiliation: Ontario Ministry of Natural Resources, Swastika Tree Nursery

Objective: To examine the effects of temperature and photoperiod on growth and bud development of greenhouse-grown black spruce seedlings. Buds were initiated under naturally declining photoperiods in the fall or under artificially reduced photoperiods of 6 or 8 hours. Seedlings from each photoperiod treatment initiated buds at either warm (20°C minimum) or cool (4°C minimum) temperatures.

6) THE USE OF PHOTOPERIOD MODIFICATION TO INDUCE BUD INITIATION

Investigators: R.C. Cameron, G. Leveille and P. Scheussler

Affiliation: Ontario Ministry of Natural Resources, Swastika Tree Nursery

Objective: To compare the speed of bud initiation in black spruce seedlings when an extended 24-hour photoperiod was reduced to natural photoperiod with that under natural photoperiods reduced to 8 hours by means of blackout curtains.

7) USE OF SHORT-DAY TREATMENT TO HARDEN GREENHOUSE STOCK FOR TRANSPLANTING

Investigators: R.C. Cameron, G. Leveille, P. Scheussler

Affiliation: Ontario Ministry of Natural Resources, Swastika Tree Nursery

Objective: To test short photoperiods as a means of reducing height growth and initiating buds in order to produce more sturdy black spruce seedlings for use as nursery transplant stock. In 1984, seedlings were tested with and without short photoperiod treatment. In 1985, different durations (0, 4, 5 and 8 days) of short (8-hour) photoperiods were tested to determine the minimum effective duration of treatment. Seedlings were examined after transplanting to determine the effects of treatment on bud development and morphology. After the nursery cultural phase, seedlings from different treatments were compared with "normal" bare-root nursery stock in semi-operational test plantings.

8) CHEMICAL ROOT PRUNING OF JACK PINE SEEDLINGS

Investigators: S.J. Colombo

Affiliation: Ontario Ministry of Natural Resources, Ontario Tree Improvement and Forest Biomass Instituite

Objective: The walls of solid containers (in this case Multipot 67s) were painted with cupric carbonate to determine: (1) non-toxic concentrations effective in root pruning jack pine seedlings as a means of increasing root fibrosity, and (2) whether, after planting, chemically pruned seedlings produced lateral roots at the top of the root plug to improve seedling stability.

9) FROZEN OVERWINTER STORAGE OF BLACK SPRUCE AND JACK PINE SEEDLINGS

Investigator: S.J. Colombo

Affiliation: Ontario Ministry of Natural Resources, Ontario Tree Improvement and Forest Biomass Institute

Objective: To examine the overwinter survival and field growth of frozen-stored FH408 Japanese paperpot seedlings with respect to shoot and root frost hardiness, shoot moisture content, bud development, and dormancy at the time of storage. Overwintered seedlings were outplanted at the Midhurst Research Station and in a glasshouse at Maple after storage.

10) THE USE OF ETHREL FOR SLOWING SHOOT ELONGATION OF CONIFER SEEDLINGS

Investigator: S.J. Colombo

Affiliation: Ontario Ministry of Natural Resources, Ontario Tree Improvement and Forest Biomass Institute

Objectives: To determine effective non-toxic concentrations of the plant growth regulator ethrel for controlling height growth of greenhouse-grown white spruce and eastern hemlock seedlings.

11) NUTRIENT-LOADING AND POST-PLANTING FERTILIZATION OF BLACK SPRUCE AND JACK PINE PAPERPOT SEEDLINGS

Investigator: S.J. Colombo

Affiliation: Ontario Ministry of Natural Resources, Ontario Tree Improvement and Forest Biomass Institute

Objectives:

1) To determine the effect of nutrient loading through fall fertilization with a 20-20-20 (N-P-K) formulation at rates of 0, 35, 150, or 350 ppm N on seedling morphology, frost hardiness, bud development, and overwintering success of black spruce and jack pine seedlings.

2) To assess field performance of nutrient-loaded stock. Seedlings in each treatment were also treated at the time of planting with slow-release fertilizer (release rates of 35, 70, 140 or 280 days).

12) EXTENDED GREENHOUSE CULTURE OF WHITE CEDAR AND EASTERN LARCH

Investigators: S.J. Colombo* and E. Raitanen**

Affiliation: *Ontario Ministry of Natural Resources, Ontario Tree Improvement and Forest Biomass Institute
**Ontario Ministry of Natural Resources, Kemptville Tree Nursery

Objective: To monitor development of frost hardiness in white cedar and eastern larch seedlings grown in Multipot containers under short daylengths.

13) EFFECT OF SEED SIZE ON GROWTH RATES OF BLACK SPRUCE SEEDLINGS

Investigators: S.J. Colombo and D.A. Skeates

Affiliation: Ontario Ministry of Natural Resources, Ontario Tree Improvement and Forest Biomass Institute

Objective: To determine whether black spruce seeds graded according to size and weight produce a more uniform crop, or if growth of seedlings germinating from large, heavy seed is more rapid than that from small, light seed.

14) DROUGHT TOLERANCE AND THE PHYSIOLOGICAL MECHANISMS OF DROUGHT RESISTANCE IN NORTHERN CONIFEROUS SEEDLINGS

Investigator: E.B. Dumbroff

Affiliation: University of Waterloo, Department of Biology

Scientific Representative: J.B. Scarratt

Objective: To investigate the physiological changes associated with the adjustment of black spruce, white spruce and jack pine seedlings to drought stress, and the determination of those changes that convey the highest degree of stress resistance. Particular attention was paid to the functions of plant growth regulators and key metabolites in the drought adjustment process.

15) PRECONDITIONING CONIFEROUS CONTAINER STOCK BY INDUCTION OF DROUGHT RESISTANCE

Investigator: E.B. Dumbroff

Affiliation: University of Waterloo, Department of Biology

Scientific Representative: C. Glerum

Objective: To develop cultural prescriptions for the production of drought-hardy black spruce, white spruce and jack pine seedlings. The three phases of this study are: 1) definition of the principal

physiological changes associated with seedling adjustment to drought stress, 2) the development of practical treatments that significantly increase drought resistance, and 3) nursery and operational field-testing in cooperation with the Ontario Ministry of Natural Resources.

16) GROWTH RATES OF BLACK SPRUCE BEFORE, DURING, AND AFTER BUD INITIATION

Investigator: R. Hong

Affiliation: Ontario Ministry of Natural Resources, Kirkland Lake District

Objective: To determine height, shoot, and root dry weight growth progressions for black spruce seedlings in the greenhouse before, during, and after bud development. Growth rates were assessed in relation to the date at which bud initiation was induced.

17) NUTRIENT PROGRESSION CURVES FOR CONTAINERIZED BLACK SPRUCE AND JACK PINE SEEDLINGS

Investigator: R. Hong

Affiliation: Ontario Ministry of Natural Resources, Kirkland Lake District

Objective: To develop a database of "normal" seedling nutrient levels that can be used to detect nutrient imbalances in tree seedlings so that corrective fertilizer applications can be made when required.

18) A COMPARATIVE STUDY OF FERTILIZATION RATES AND THE GROWTH OF BLACK SPRUCE SEEDLINGS

Investigators: R. Hong* and L. Barrette**

Affiliation: *Ontario Ministry of Natural Resources, Kirkland Lake District
**North Gro Development Limited

Objective: To determine optimum nutrient application levels for growing overwintered crops of black spruce seedlings. Seedling morphology was monitored to identify fertilizer deficiency and toxicity levels.

19) HYDROPONIC TREE SEEDLING CULTURE

Investigator: H. Julinot

Affiliation: Greens Alive Inc.

Scientific Representative: J. Sykes

Objective: To study the suitability of a hydroponic cultural system, currently used for growing vegetables, for the production of tree seedlings, and to test a new greenhouse design and determine its economic feasibility.

20) DEVELOPMENT OF AN OPERATIONAL GREENHOUSE TRANSPLANT SYSTEM WITH CASTLE AND COOKE PLUGS

Investigators: R. Klapprat, B.J. Phillion, and M. Palcic

Affiliation: Ontario Ministry of Natural Resources, Thunder Bay Tree Nursery

Objective: To modify the Castle and Cooke system for the production of black spruce greenhouse transplant stock.

21) CONDITIONING CONTAINER SEEDLINGS TO ENHANCE DROUGHT AND HEAT TOLERANCE

Investigators: R.S. Koppenaal and S.J. Colombo

Affiliation: Ontario Ministry of Natural Resources, Ontario Tree Improvement and Forest Biomass Institute

Objective: To increase the tolerance of jack pine, white spruce, and black spruce container stock to post-planting stresses (i.e., drought and high temperatures) encountered on harsh planting sites. Techniques for conditioning seedlings that are being examined include drought conditioning by imposed water stress, short-day inducement of spruce bud initiation, and ion loading with potassium salts.

22) THE EFFECT OF MODIFIED GROWING MEDIA ON JACK PINE SEEDLING DEVELOPMENT

Investigator: E. LaPorte

Affiliation: Ontario Ministry of Natural Resources, Thessalon Tree Nursery

Objective: To monitor the morphological development and physiological attributes of containerized jack pine seedlings grown in various peat:vermiculite growing media.

23) MACRONUTRIENT DEFICIENCY SYMPTOMS IN JACK PINE SEEDLINGS

Investigator: E. LaPorte

Affiliation: Ontario Ministry of Natural Resources, Thessalon Tree Nursery

Objective: To describe the physical and physiological attributes of containerized jack pine seedlings deficient in macronutrients.

24) INDUCTION OF ROOT PROLIFERATION IN CONTAINERIZED CONIFER SEEDLINGS

Investigator: E. LaPorte

Affiliation: Ontario Ministry of Natural Resources, Thessalon Tree Nursery

Objective: To develop cultural regimes for inducing root proliferation in containerized jack pine, red pine, and white pine seedlings.

25) THE EFFECT OF FERTILIZER REGIME ON JACK PINE SEEDLING GROWTH

Investigator: E. LaPorte

Affiliation: Ontario Ministry of Natural Resources, Thessalon Tree Nursery

Objective: To modify standard fertilization regimes in an attempt to increase foliar calcium and magnesium contents, and to reduce the shoot:root ratio of containerized jack pine seedlings.

26) THE EFFECT OF GREENHOUSE ENVIRONMENT ON THE SPEED OF BUD INITIATION IN BLACK SPRUCE SEEDLINGS

Investigator: K.D. Odlum and S.J. Colombo

Affiliation: Ontario Ministry of Natural Resources, Ontario Tree Improvement and Forest Biomass Institute

Objective: To determine the manner in which cultural practices within the greenhouse influence the speed of bud initiation in black spruce seedlings. Day and night temperatures, photoperiod, nutrients, and drought are being investigated.

27) EFFECT OF CONTAINER SIZE AND SPACING ON RED PINE SHOOT MORPHOLOGY

Investigator: J.B. Scarratt

Affiliation: Canadian Forestry Service, Great Lakes Forestry Centre

Objective: To investigate factors influencing shoot development in red pine seedlings in the greenhouse. An evaluation was made of the growth of seedlings raised in five sizes of Japanese paperpots (FH208, FH308, FH408, FH508, FH608) at various spacings.

28) EFFECT OF TRANSPLANTING UPON SUBSEQUENT SEEDLING DEVELOPMENT

Investigator: J.B. Scarratt

Affiliation: Canadian Forestry Service, Great Lakes Forestry Centre

Objective: To determine whether transplanting germinant seedlings at various ages to achieve full container tray stocking has adverse effects on subsequent seedling growth.

29) EVALUATION OF THE EFFECTS OF MULTIPLE SEEDLINGS IN CONTAINERS

Investigator: J.B. Scarratt

Affiliation: Canadian Forestry Service, Great Lakes Forestry Centre

Objective: To determine the effect of multiple (2-4) seedlings per container on seedling growth in the greenhouse and on subsequent survival and growth after outplanting.

30) FERTILIZER TRIALS (1)

Investigator: J.B. Scarratt

Affiliation: Canadian Forestry Service, Great Lakes Forestry Centre

Objective: To compare growth rates of black spruce seedlings to which various commercial formulations (including the W.R. Grace and Plant Products companies' special forestry formulations) have been applied with those to which grower-formulated fertilizers have been applied.

31) FERTILIZER TRIALS (2)

Investigator: J.B. Scarract

Affiliation: Canadian Forestry Service, Great Lakes Forestry Centre

Objective: To determine the effect of seedling age at the start of fertilizer application and of the initial rate of fertilization on subsequent seedling development in the greenhouse.

32) OVERWINTERING OF CONTAINER STOCK

Investigator: J.B. Scarratt

Affiliation: Canadian Forestry Service, Great Lakes Forestry Centre

Objective: To reduce the risk of winter injury to container stock by modifying conditions for outdoor overwinter storage. In the most recent study (1985-1986) the effect of a perforated plastic sheet over the crop was evaluated.

33) EFFECT OF WATER QUALITY ON GROWTH OF CONTAINER STOCK

Investigators: J.B. Scarratt*, E. McCarthy**, V.R. Timmer**

Affiliation: * Canadian Forestry Service, Great Lakes Forestry Centre
** University of Toronto, Faculty of Forestry

Objective: To investigate the effects of irrigation with water containing high concentrations of Na, Cl and Fe ions on seedling growth at a private containerized seedling nursery near Sault Ste. Marie. The effects of irrigation with these water sources on the growth medium and on foliar nutrient levels were examined.

34) EVALUATION OF PEAT TYPE AND FERTILIZATION REGIME IN THE PRODUCTION OF CONTAINERIZED PLANTING STOCK

Investigator: V.R. Timmer

Affiliation: University of Toronto, Faculty of Forestry

Objective: To investigate growth and mineral nutrition of black spruce, jack pine, and red pine seedlings grown in 26 different commercial peats. The physical attributes of seedlings will be compared by correlation analysis of the initial physical and chemical properties of the different peats. In addition, fertilization trials comparing seedling growth in complete nutrient solutions with growth in unbalanced formulations will be undertaken to assess the use of foliar nutrient analysis as a plant diagnostic technique.

SECTION II

PLANTING TRIALS

35) DEVELOPMENT OF WEED CONTROL PRESCRIPTION ON FERTILE PLANTING SITES IN NORTHERN ONTARIO

Investigators: R.A. Campbell*, A. Lehela*, and J.E. Wood**

Affiliation: *Ontario Ministry of Natural Resources, Pest Control Section
**Canadian Forestry Service, Great Lakes Forestry Centre

Objective: To determine the silvicultural and herbicidal efficacy of hexazinone (Velpar® L) and glyphosate (Roundup®) applied at various rates to experimental plots planted with jack pine and black spruce paperpot and bare-root stock. Crop trees were planted in the year of the herbicide application, as well as in the previous and subsequent years.

36) CHEMICAL SITE PREPARATION OF FERTILE PLANTING SITES IN NORTHERN ONTARIO

Investigators: R.A. Campbell*, F.W. von Althen** and J.E. Wood**

Affiliation: *Ontario Ministry of Natural Resources, Pest Control Section
**Canadian Forestry Service, Great Lakes Forestry Centre

Objective: To assess the silvicultural and herbicidal efficacy of applying granular hexazinone (Pronone®) immediately after winter shearblading. Two formulations of Pronone® were applied (January 1985) at two rates, for a total of four herbicidal treatments plus a control. Black spruce 1½+1½ transplant stock and FH508 Japanese paperpot seedlings were planted in June, 1985 and rising 1½+2½ transplant stock and FH408 Japanese paperpot seedlings were planted in July of the same year on a recently cutover site with fine-textured soils near Matheson, Ontario. Outplants will be assessed for survival and growth 1, 2, 3, and 5 years after planting.

37) THE EFFECT OF SPECIES, STOCK TYPE, AND SITE PREPARATION ON THE COST OF ESTABLISHING CONIFER PLANTATIONS

Investigators: R. Greenwood* and S.W. Preiss**

Affiliation: *Ontario Ministry of Natural Resources, Northern Forest Development Group
**McChesney Lumber Division, E.B. Eddy Forest Products Ltd.

Objective: To compare the cost of establishing jack pine (FH408 Japanese paperpot and 2+0 bare-root stock), black spruce (FH408 Japanese paperpot), and white spruce (2+2 bare-root stock) plantations on sites prepared for planting by using 16 different site preparation treatments. Seedling growth and survival will be monitored periodically.

38) WATER RELATIONS OF ION-LOADED JACK PINE CONTAINER SEEDLINGS ON A BOREAL CUT-OVER SITE

Investigators: S.C. Grossnickle*, E. LaPorte** and J.K. Heikurinen***

Affiliation: *University of Toronto, Faculty of Forestry
**Ontario Ministry of Natural Resources, Thessalon Tree Nursery
***Ontario Ministry of Natural Resources, Northeastern Region

Objective: To determine the physiological response of recently planted containerized seedlings to field conditions by comparing the water relations of ion-loaded and control (non-loaded) stock.

39) A COMPARISON OF WATER RELATIONS AND MORPHOLOGICAL DEVELOPMENT OF NEWLY PLANTED BARE-ROOT AND CONTAINER JACK PINE AND BLACK SPRUCE SEEDLINGS ON BOREAL CUT-OVER SITES

Investigators: S.C. Grossnickle and T.J. Blake

Affiliation: University of Toronto, Faculty of Forestry

Objective: To compare the water relations and growth of bare-root and containerized jack pine and black spruce seedlings after field planting over a range of typical boreal sites.

40) REPORT ON THE WALTERS BOMB FOR PLANTING TREES

Investigator: D. Jefferson

Affiliation: Ontario Ministry of Natural Resources, Cochrane District

Objective: To test the effectiveness of the Walters bomb.

41) CONTAINER STOCK TRIAL 1985 - COCHRANE DISTRICT

Investigator: W. Moryto

Affiliation: Ontario Ministry of Natural Resources, Cochrane District

Objective: To compare post-planting root development and overall growth of black spruce seedlings sown on different dates and grown in different container types.

42) A COMPARISON BETWEEN THE FIELD PERFORMANCE OF EASTERN LARCH ROOTED CUTTINGS AND JACK PINE AND BLACK SPRUCE SEEDLINGS

Investigator: S.W. Preiss

Affiliation: McChesney Lumber Division, E.B. Eddy Forest Products Ltd.

Objective: To compare the field performance of eastern larch rooted cuttings (grown in Leach tubes) with that of seedlings of jack pine and black spruce grown in FH408 Japanese paperpots. Field trials were carried out on two sites near Foleyet, Ontario.

43) CONTAINER STOCK SPECIFICATIONS

Investigator: J.B. Scarratt

Affiliation: Canadian Forestry Service, Great Lakes Forestry Centre

Objective: To develop preliminary prescriptions for seedling morphology and container size, and for the associated growing regimes for container seedlings in northern Ontario. Objectives include the determination of: 1) optimum seedling specifications for sites currently being planted to container stock, and 2) the range of site conditions under which container seedlings may be planted with success. Performance of up to nine grades (seedling size x container size) of containerized black spruce, white spruce, and jack pine seedlings is compared with that of current grades of bare-root stock on a range of site conditions. Results provide input into the "Silvicultural Prescriptions for Containerized Planting" study (No. 54 in this registry).

44) FIELD PERFORMANCE OF BLACK SPRUCE SEEDLINGS GROWN IN PEAT PILLOWS AND JAPANESE PAPERPOTS

Investigators: J.B. Scarratt and J.E. Wood

Affiliation: Canadian Forestry Service, Great Lakes Forestry Centre

Objective: Outplantings were established on two boreal sites to compare the survival and growth of seedlings grown in Peat Pillows with those of FH408 Japanese paperpots. Seedlings were planted on an upland site on mineral soil and on a peatland site on feathermoss and *Sphagnum* seedbeds.

45) FIELD PERFORMANCE OF BARE-ROOT AND CONTAINERIZED BLACK SPRUCE SEEDLINGS

Investigator: R.G. Seabrook

Affiliation: Great Lakes Forest Products Ltd.

Objective: To compare the performance of large black spruce container stock with traditional bare-root transplant stock planted on upland sites. Survival and growth after planting of black spruce 1½+1½ transplant stock were compared with those of several grades of FH408 Japanese paperpot seedlings: 1984 current crop overwintered, 1984 summer crop overwintered, and 1985 current crop.

46) PEAT-PILLOW PLANTING TRIAL

Investigator: R.G. Seabrook

Affiliation: Great Lakes Forest Products Ltd.

Objective: To test the field performance of black spruce grown in peat pillows and planted in site-prepared furrows on uplands, and on hummocks of *Sphagnum* on lowlands.

47) PREPLANTING FERTILIZER SOAKING TRIAL

Investigator: R.G. Seabrook

Affiliation: Great Lakes Forest Products Ltd.

Objective: To determine the effect on early field growth and survival of applying soluble fertilizer at four different concentrations to the soil plug of jack pine and black spruce in FH408 Japanese paperpots prior to outplanting.

48) FIELD PERFORMANCE OF BLACK SPRUCE ROOTED CUTTINGS FROM FULL SIB CROSSES AT GLENCAIRN ORCHARD

Investigators: G. Stanclik and N.J. Saltarelli

Affiliation: Abitibi-Price Inc.

Objective: To conduct a plus-tree progeny trial to test the performance of overwintered cuttings rooted in FH408 paperpots and outplanted on shearbladed upland sites.

49) WORK ORGANIZATION FOR PLANTING OPERATIONS

Investigator: E. Stjernberg

Affiliation: Forest Engineering Research Institute of Canada (FERIC)

Objective: To determine factors that affect productivity in the manual planting of containerized and bare-root seedlings. Transportation of seedlings from the nursery to the planting site, organization of the planting crews, and the influence of site preparation were examined in this continuing series of field studies.

50) BRÄCKE SCARIFIER MOUNDING TRIAL

Investigators: R.F. Sutton and J.E. Wood

Affiliation: Canadian Forestry Service, Great Lakes Forestry Centre

Objective: To compare the field performance of jack pine 2+0 bare-root stock with that of seedlings in FH408 Japanese paperpots. Seedlings were planted in 1984 on two volumes (10 L and 20 L) of pimple- and dimple-shaped mineral mounds, created in 1983, located both within Bräcke scarified patches and on patch minimounds, with and without chemical site preparation. This work is being done in cooperation with the Algoma Central Railway, Sault Ste. Marie, Ontario. Crop trees were assessed in 1984 and 1985.

51) EFFECT OF PAPER CONTAINERS ON JACK PINE ROOT EGRESS

Investigator: P.F. Tufford

Affiliation: Lakehead University, School of Forestry

Objective: To survey forest plantations to determine if paper containers inhibit jack pine root egress after planting.

52) CONTAINER STOCK PERFORMANCE ASSESSMENT

Investigators: K. Virgo*, H. MacLean** and V. Wearn***

Affiliation: *Spruce Falls Power and Paper Co. Ltd.
**Ontario Ministry of Natural Resources, Kapuskasing District
***Ontario Ministry of Natural Resources, Northern Forest Development Group

Objective: To assess survival, growth, and root development after planting black spruce seedlings grown in peat pillows (overwintered), FH408 Japanese paperpots (overwintered and current), FH508 Japanese paperpots (current), Combicells (overwintered and current), and Multipots (current). Bare-root transplant stock was included for comparison. Seedlings were planted in 1983 on three sites varying from fine sand to deep organic matter.

53) CONTAINER STOCK TRIAL 1984 - KAPUSKASING DISTRICT

Investigators: V. Wearn*, K. Virgo**, H. MacLean***

Affiliation: *Ontario Ministry of Natural Resources, Northern Forest Development Group
**Spruce Falls Pulp and Paper Co. Ltd.
***Ontario Ministry of Natural Resources, Kapuskasing District

Objective: To assess root development and growth of different black spruce container seedling stock types after planting.

54) SILVICULTURAL PRESCRIPTIONS FOR CONTAINERIZED PLANTING

Investigator: J.E. Wood

Affiliation: Canadian Forestry Service, Great Lakes Forestry Centre

Objective: A continuing study (initiated in 1982) to assess the performance of several grades (stock size x container size) of container stock on a range of sites on which various site preparation methods were used. Emphasis is being placed on black spruce grown in FH408 and FH508 Japanese paperpots. Four grades of paperpot stock were planted during the traditional spring

planting season and three grades during summer (July), with operational grades of bare-root transplant stock being included for comparative purposes. Plantings (in the Ontario Ministry of Natural Resources' Northern Region) were conducted in 1982, 1984 and 1985, and outplants were assessed in 1984 and 1985.

SECTION III

EQUIPMENT DEVELOPMENT

55) SHORT-DAY TREATMENT FOR INDUCING BUD INITIATION IN BLACK SPRUCE SEEDLINGS GROWN IN A VENTILATED GREENHOUSE

Investigator: L. Barrette

Affiliation: North Gro Developments Ltd.

Objective: To test a ventilated greenhouse blackout system in which high temperatures may be avoided during the short-day treatment of seedlings.

56) WOVEN-POLY GREENHOUSE COVER (1982-1983)

Investigators: R.C. Cameron and R. Keith

Affiliation: Ontario Ministry of Natural Resources, Swastika Tree Nursery

Objective: To test the suitability of a woven-poly greenhouse cover for growing black spruce and jack pine container seedlings.

57) ONE-SHOT CONTAINER PLANTING MACHINE

Investigator: J.F. Flowers

Affiliation: Lakehead University, School of Forestry

Objective: To redesign the original planting mechanism of a one-shot planter to ensure proper positioning of containerized (Japanese paperpots and Spencer-Lemaire) seedlings during planting.

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